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Indication of Navigation Information: Consideration of Algorithm

<Drilling Machining> Tool diameter≧ϕ3

TABLE A

Spindle Load≦SF?	Cutting Speed≦WJ?	Spindle Rotating Speed≦CH?	Processing
No	No	–	–
No	Yes	–	
Yes	No	–	Navigation Information Number 2 is displayed. (Change cutting tool material.)
Yes	Yes	–	Navigation Information Number 1 is displayed. (Increase cutting speed.)

<End Mil (Roughing) Machining>

TABLE B

Spindle Load≦SF?	Cutting Speed≦WJ?	Spindle Rotating Speed≦CH?	Processing
No	No	No	–
No	No	Yes	Navigation Information Number 4 is displayed. (Change cutting tool material.)
No	Yes	No	
No	Yes	Yes	Navigation Information Number 3 is displayed. (Increase cutting speed.)
Yes	No	No	Navigation Information Number 4 is displayed. (Change cutting tool material.)
Yes	No	Yes	Navigation Information Number 4 is displayed. (Change cutting tool material.)
Yes	Yes	No	Navigation Information Number 3 is displayed. (Increase cutting speed.)
Yes	Yes	Yes	Navigation Information Number 3 is displayed. (Increase cutting speed.)

<Face Mil (Roughing) Machining>

TABLE C

Spindle Load≦SF?	Cutting Speed≦WJ?	Spindle Rotating Speed≦CH?	Processing
No	No	No	–
No	No	Yes	Navigation Information Number 6 is displayed. (Change cutting tool material.)
No	Yes	No	
No	Yes	Yes	Navigation Information Number 5 is displayed. (Increase cutting speed.)
Yes	No	No	
Yes	No	Yes	Navigation Information Number 7 is displayed. (Change tool diameter.)
Yes	Yes	No	Navigation Information Number 5 is displayed. (Increase cutting speed.)
Yes	Yes	Yes	Navigation Information Number 5 is displayed. (Increase cutting speed.)

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Navigation Information Number	Message
1	·Increasing cutting speed to limit value is possible
2	·Change cutting tool material and increase cutting speed Change HSS tool (small diameter) to carbide tool Change HSS tool (large diameter) to throw away tool Change carbide tool to coolant through tool (for spindle through machines) Change carbide tool to carbide coating tool (for non-spindle through machines)
3	·Increase cutting speed to limit value (fix cutting speed if cutting speed is equal to or higher than maximum spindle rotating speed)
4	·Change cutting tool material and increase cutting speed Change HSS tool (small diameter) to carbide tool Change HSS tool (large diameter) to throw away tool
5	·Increasing cutting speed to limit value is possible (fix cutting speed if cutting speed is equal to or higher than maximum spindle rotating speed)
6	·Change cutting tool material and increase cutting speed Change carbide tool to carbide coating tool (except when the workpiece material is AL)
7	·Decrease tool diameter and increase rotating speed
8	·Increasing cutting speed to limit value is possible (fix cutting speed if cutting speed is equal to or higher than maximum spindle rotating speed)
9	·Change to tool with a larger teeth number and increase feed rate ·Change cutting tool material and increase cutting speed ·Change HSS tool to carbide tool Change carbide tool to carbide coating tool (except when the workpiece material is AL)
10	·Change to tool with a larger teeth number and increase feed rate ·Change cutting tool material and increase cutting speed (except when workpiece material is AL) Change carbide tool to carbide coating tool or cermet tool Change carbide coating tool to cermet tool
※) The above may change depending on conditions of workpiece clamping and cutting tools. Life of tools may be shortened.	

Table D

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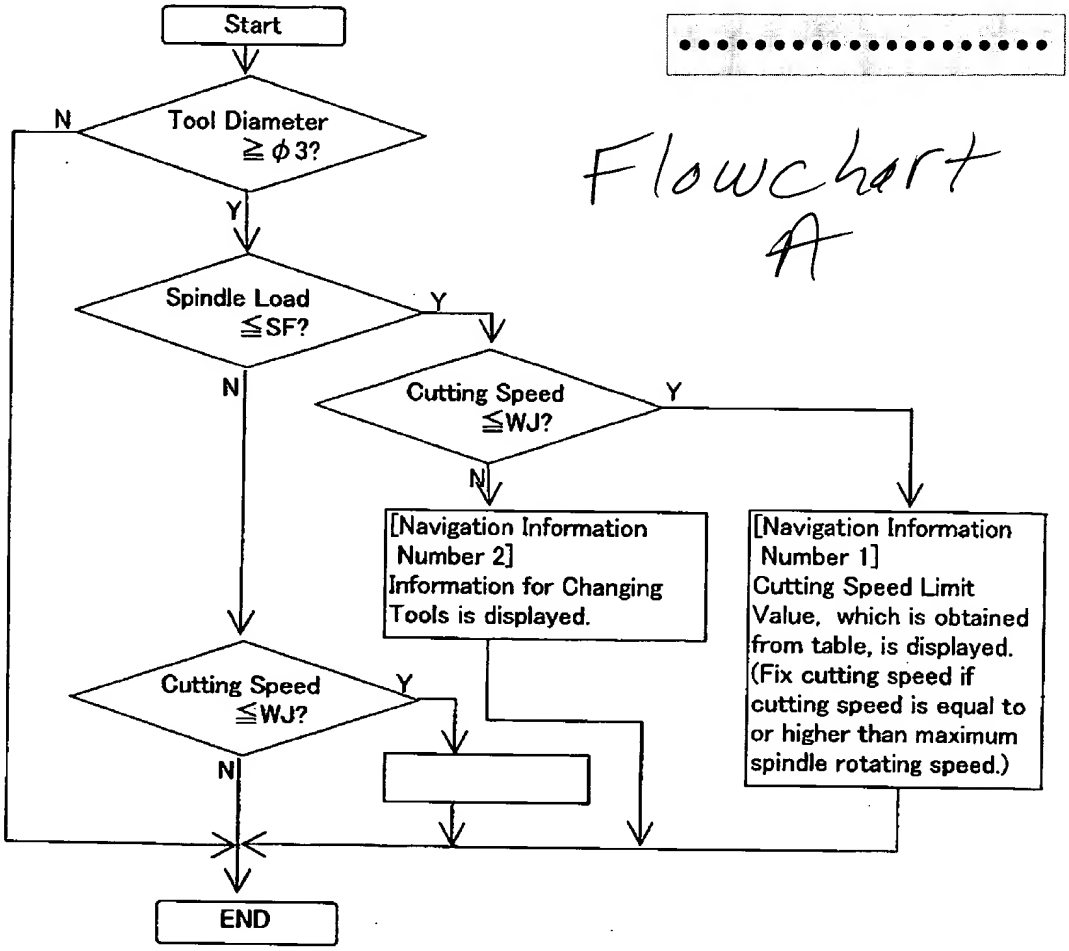
Machining Navigation: Navigating Function Flow Chart

Drilling Machining



Flowchart A

1) Spindle Load Limit Value Parameter···80% (default: 80%)
2) Drilling Machining Cutting Speed Limit Value Table
Cutting speed limit value is calculated in accordance with the rules for automatically determining cutting conditions.

	Basic Cutting Speed Limit Value
FC	29
FCD	26
S45C	29
SCM	23
SUS	14
AL	75
CU	75
···	

Workpiece Material m/min

	Compensation Coefficient
HSS	100
Carbide	220
HSS Coating	145
Coolant Through	460
Throw Away	560
Brazed	240

Tool Material %

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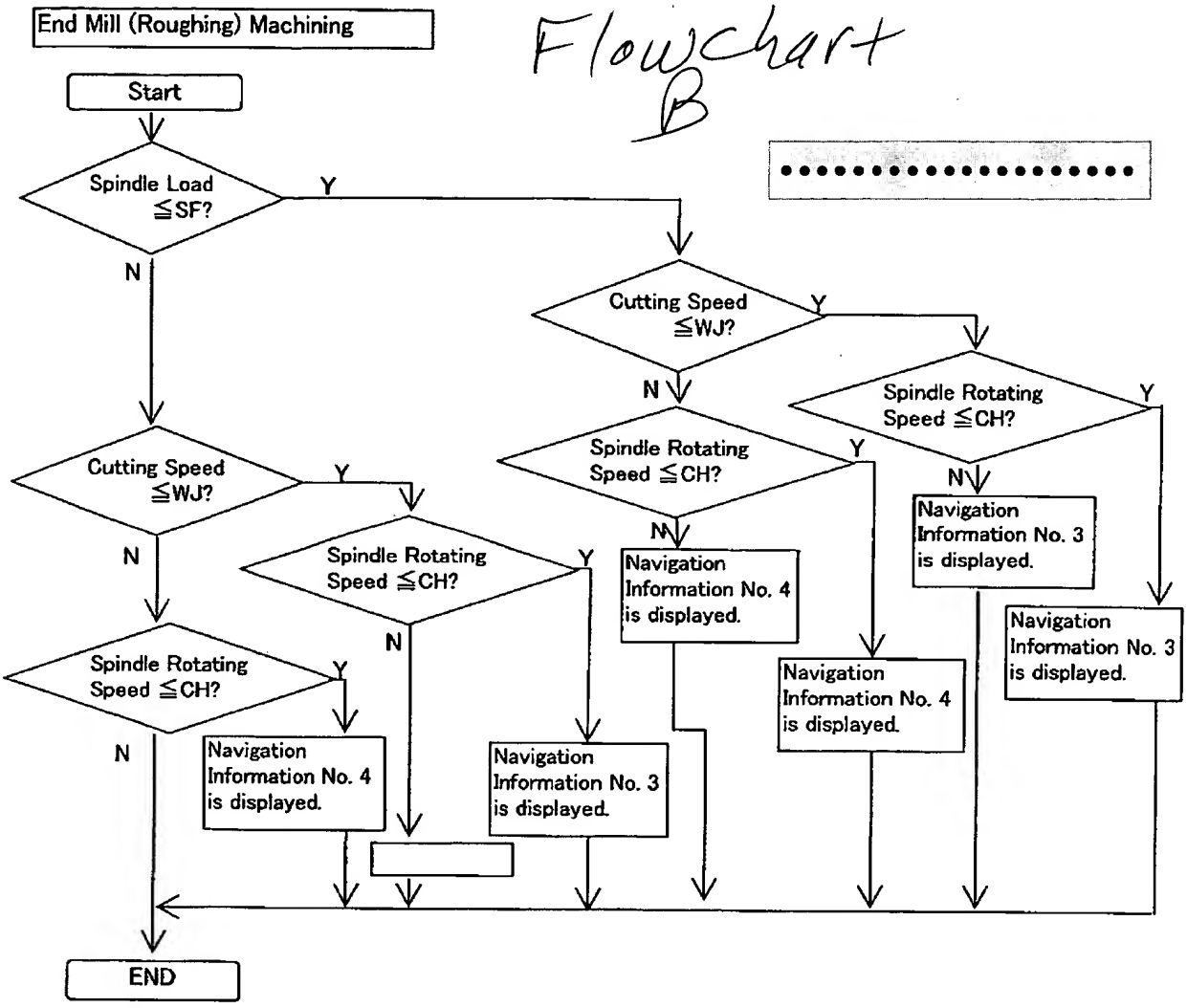

3) End Mill Machining Cutting Speed Limit Value Table

Cutting speed limit value is calculated in accordance with the rules for automatically determining cutting conditions.

	Basic Cutting Speed Limit Value
FC	124
FCD	104
S45C	98
SCM	92
SUS	86
AL	690
CU	230
...	

	Compensation Coefficient
HSS	27
Carbide	100
HSS Coating	32
Carbide Coating	112
Roughing	38
Throw Away	150
...	

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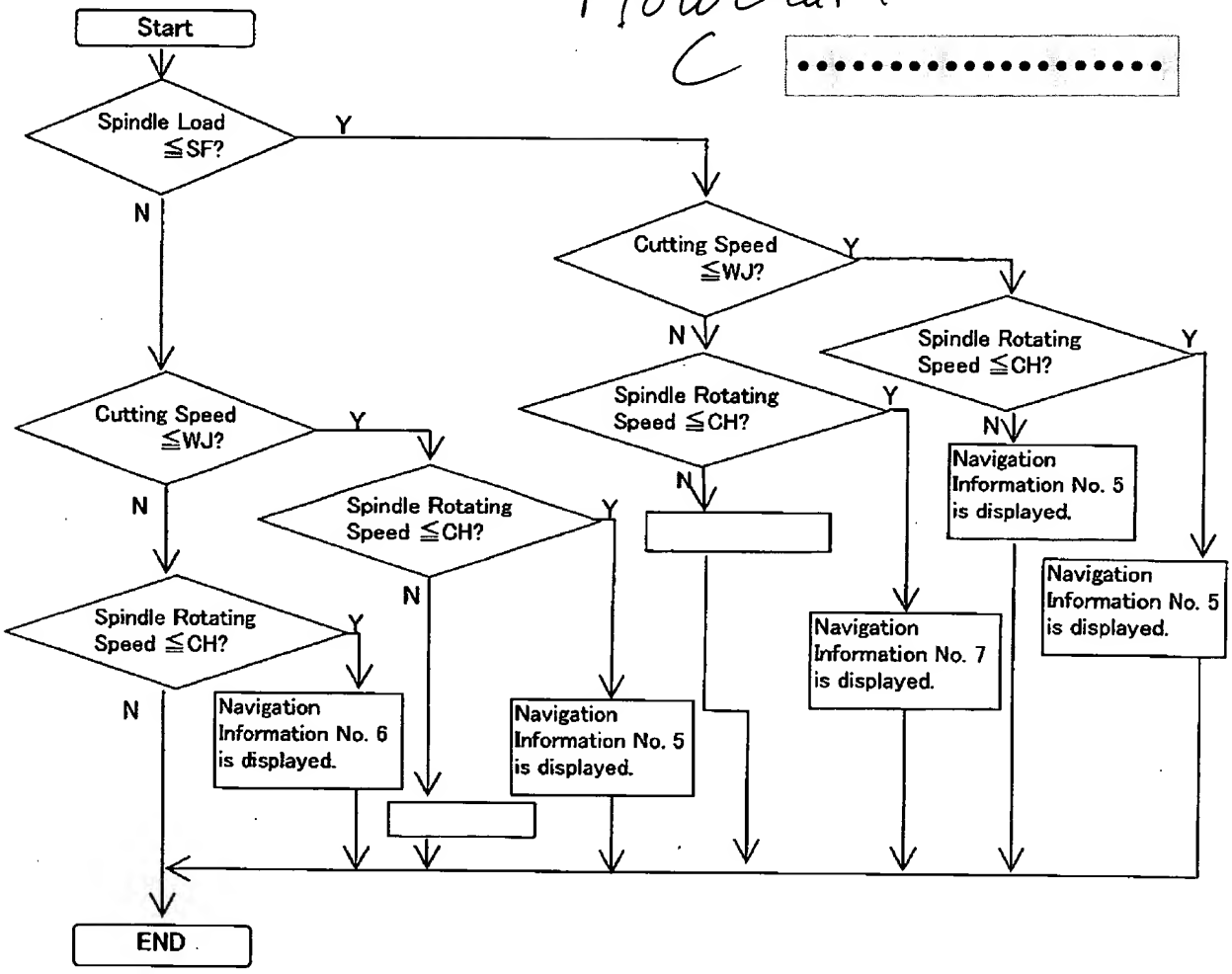
Face Mill (Roughing) Machining

Flowchart C



3) Face Mill Machining Cutting Speed Limit Value Table

Cutting speed limit value is calculated in accordance with the rules for automatically determining cutting conditions.

	Basic Cutting Speed Limit Value
FC	138
FCD	124
S45C	184
SCM	138
SUS	184
AL	990
CU	300
...	

	Compensation Coefficient
Carbide	100
Cermet	120
Carbide Coating	115
...	

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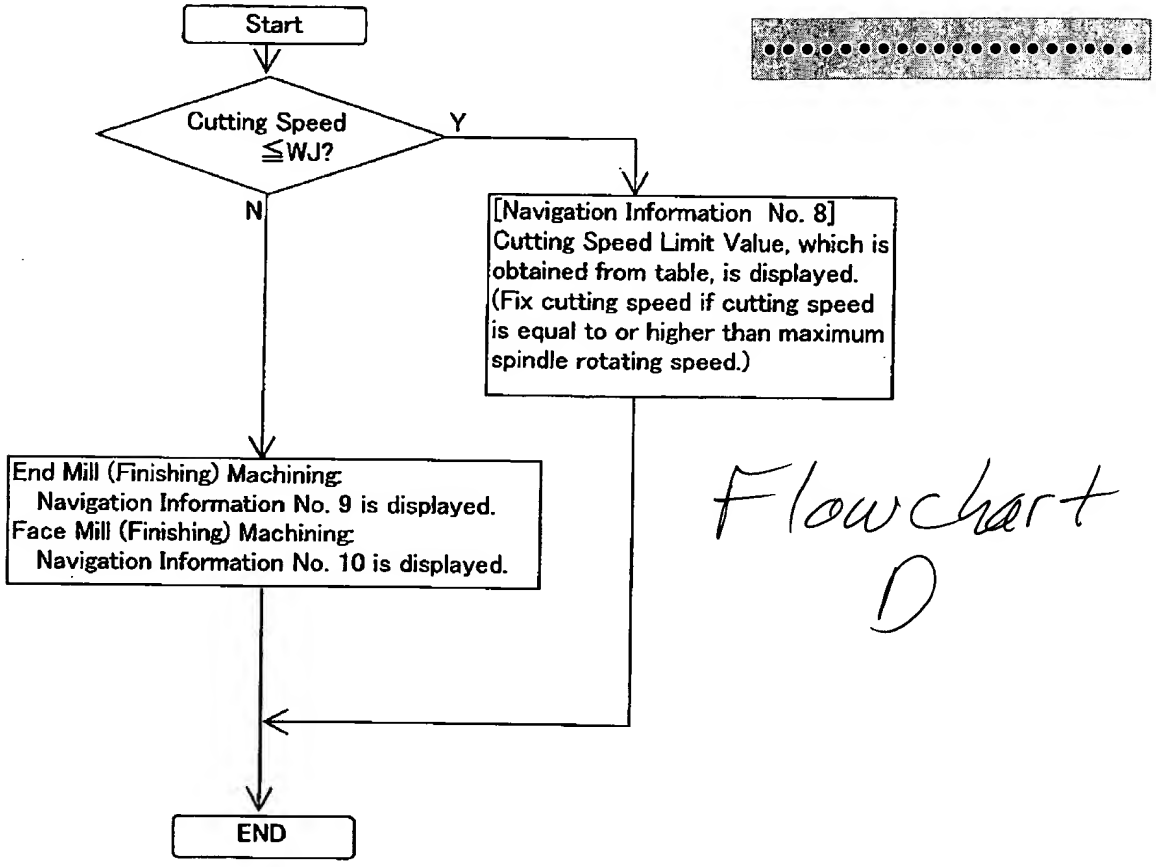
End Mill (Finishng) Machining, Face Mill (Finishing) Machining and ~~Drilling Machining~~



Flowchart D

4) Drilling Machining Cutting Speed Limit Value Table
Cutting speed limit value is calculated in accordance with the rules for automatically determining cutting conditions.

	Basic Cutting Speed Limit Value
FC	69
FCD	80
S45C	109
SCM	92
SUS	288
AL	143
CU	
...	

	Compensation Coefficient
HSS	55
Carbide	100
Cermet	100
Balanced Cut	120
...	